



## Case report

### Fatal accidental asphyxia in a jack-knife position

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#### ABSTRACT

Accidental death from postural or positional asphyxia takes place when the abnormal position of the victim's body compromises the process of respiration. Diagnosis is largely made by circumstantial evidence supported by absence of any other significant pathology or trauma explaining death. This case report is about a 50-year-old male who had been drinking the previous night and was found dead in the morning inside a tire repair shop. His jack-knifed body had been encompassed, buttocks-down, within the hollow core made by 3 big tires stacked on top of each other. The author was called to the scene of death and had hands-on encounter with the body in-situ where scene photographs were taken. Apart from a blood alcohol of 290 mg/100 ml, marked congestion of the face, petechial hemorrhages on the conjunctivae and lung edema and congestion, autopsy findings were unremarkable. Abrasions on shoulders, lateral aspects of arms and posterior aspects of lower legs indicated friction with internal rims of tires while slipping down. There were no other injuries or pathology to account for his death. Death was determined to be due to accidental postural asphyxia secondary to intoxication by alcohol.

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## 1. Introduction

Accidental death from positional or postural asphyxia occurs when the victim's position interferes with adequate breathing by causing partial or complete airway obstruction. Being in an inverted or head-down position for an extended period of time suppresses normal respiration and circulation. Mechanical and gravitational forces exert pressure on the diaphragm by the weight of the viscera.<sup>1</sup> In addition, the normal venous return to the heart is impaired, causing brain hypoxia consequent on severe congestion of the brain.<sup>2,3</sup> It is not necessary that the whole body is inverted to cause death from positional asphyxia, as partial inversion of the torso, hyper-flexion of the neck or face down position during inebriation can also be fatal.<sup>4,9</sup>

Fatal positional asphyxia is usually accidental and associated with drunkenness or other intoxicants or disabilities. It may also be a factor in a proportion of the rare cases of sudden deaths occurring during restraint by police, prison officers and health care staff.<sup>5</sup> Even in the presence of the abnormal posture, the diagnosis of positional asphyxia is conditional on excluding other possible significant underlying causes of death.

The importance of this case report is attributed to the availability of scene photographs of the undisturbed scene of death which were extremely helpful in illustrating the cause and manner

of death to the reader. The forensic pathologist (author) was called to the scene, examined the body before it was moved and instructed the forensic photographer to take appropriate pictures. This wouldn't have been possible without the call system adhered to in our department, whereby the forensic medical examiner is summoned to the scenes of all suspicious deaths.

## 2. Case report

The deceased, a 50-year-old male was known to have a habit of sleeping rough and of consuming alcoholic beverages. The forensic medical examiner was summoned by the police and arrived promptly at the scene which was a garage or a shop for repairing big lorry tires. Big tires were stacked everywhere inside the shop. At the back of the shop there was a partially opened window. Three big identical tires were stacked on their sidewalls, one on top of the other in close proximity to that window (Fig. 1). The 3 tires stand to a height of 105 cm, with a rim diameter of 55 cm, which consecutively make the depth and width of the hollow core made up by their compiled rim cavities. The victim's body was encompassed in a jack-knife position, rear end down, within that tight well-shaped hollow core. His head was at the level of the middle tire and ankles and feet showing above the upper sidewall of the top tire (Fig. 2). The head and neck and torso were severely hyper flexed in restricted jack-knife position, unfavorable for respiration. The author supervised the removal of the tires one at a time photographing each step (Fig. 3). At the bottom, rubber air tubes were

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**Fig. 1.** The original scene of death showing the victim's jack-knifed body, encompassed buttocks-down within the central hollow of 3 big tires stacked on top of each other.

located and urine was collected within its crevices. Wetness was noted on the trousers of the victim which was thought to be due to urine. The ambulance team arrived ahead of the forensic medical examiner, unbuttoned his shirt and applied stick-on ECG leads on his chest. The body was fully rigid by rigor mortis, so when the two upper tires were removed, the unsupported legs stood horizontally defying gravity. The lower limbs were kept semi-flexed at the knees making an almost perfect 90° angles (Fig. 4).

#### 2.1. External examination

The body was that of an Indian male in his fifth decade, of 177 cm in height and weighing 66 kg. The deceased was known of his alcohol drinking and of sleeping rough. He was wearing a shirt and trousers. He had a wrist watch on his left hand and a bracelet on his right. Fixed post-mortem hypostasis involved the back of the lower-back, the buttocks and the thighs. The face and neck were extensively swollen and congested (Fig. 5). Pressure abrasions involved the lateral aspects of the elbows, wrists, forearms, shoulders (Fig. 6) and back of the lower legs (Fig. 7). Localized abrasions on the upper chest indicate pressure exerted by the chin of the hyper flexed head (Fig. 5). Bilateral sub-conjunctival



**Fig. 3.** The victim's body after lifting the two uppermost tires.

hemorrhages were also noted. There were no other external injuries on the body which was fully rigid.

#### 2.2. Internal examination

There were multiple hemorrhagic patches on the undersurface of the scalp, particularly on the frontal and parietal areas. The neck structures were intact including the cervical vertebrae, which was confirmed by radiology. The vessels of the brain were markedly congested and the brain was edematous. The lungs were edematous and congested with frothy fluid in the trachea, bronchi and bronchioles. The overall lung weight was 950 gm. The heart was normal from all respects, including its coronaries, valves and great blood vessels. The abdominal viscera were generally congested. The stomach contained a small amount of semi-digested food. The liver was enlarged, weighing 1750 gm and showed fatty change. The urinary bladder was empty. A sample of blood was sent to the toxicology laboratory for analysis and found to contain ethanol in a concentration of 290 mg/100 ml.

#### 3. Discussion

The diagnosis of accidental postural or positional asphyxia depends largely on circumstantial evidence. It is essentially based



**Fig. 2.** The victim's body in situ after removal of the uppermost tire.



**Fig. 4.** A side view demonstrating the effect of rigor mortis holding the unsupported legs up against gravity.



**Fig. 5.** The swollen, congested face of the victim with protrusion of the tip of the tongue from the mouth. Note the faint abrasion on the chest marking the point where his jaw had been pressed hard against it.

on the following criteria: the body must be in such position that normal respiratory movements were impaired, accidental nature must be ascertained by scene investigation or historical evidence, it must be impossible to move to another position, and other



**Fig. 6.** Bilateral abrasions on the shoulders at the contact points with the rough internal rim of the tires.



**Fig. 7.** Abrasions on the back of both lower legs indicating contact with the internal rim of the tires.

significant underlying causes of death natural or violent nature must be excluded.<sup>4,6</sup>

Death from positional asphyxia was reported in a variety of circumstances such as reverse suspension,<sup>7,8</sup> Hyper-flexed head or head-down position<sup>3,4,9</sup> and 'jack-knife position'.<sup>1</sup> In most of the reported cases the victim was intoxicated or incapacitated to a degree that it was impossible to move out of that abnormal position. Fatalities occurred while victims were restrained in prone position in rear compartments of police patrol cars.<sup>5</sup> The impairment of respiration from pressure of the abdominal viscera on the diaphragm is complicated further by the central depressant effect of alcohol on the respiratory centre.<sup>7</sup> It has also been suggested that the reduced venous return to the heart is an important mechanism in the patho-physiology of postural asphyxia.<sup>10,11</sup>

In this case, the high blood level of ethanol played a major role in accord with the findings of previous researchers.<sup>4</sup> It would have impaired the normal judgment, consciousness and normal reflexes of the victim. Two scenarios could have played part in causing his fall in that death trap. For once, he could have entered the repair shop from the window, stepped on the top of tires, and fell breach-down inside the cavity made by their internal rings. A more likely scenario would be that he had slept across the upper sidewall of the top tire, his midsection lying unsupported, partially suspended over the rim cavity. During sleep and under the effect of alcohol, his midsection slipped down and dragged the rest of his body to become impacted inside the 1 meter well. His body was restricted in a jack-knife position where extreme hyper-flexion of head and neck and abdomen was incompatible with adequate respiration. The impaired state of consciousness and depressed reflexes from alcohol intoxication made it impossible for him to move from that death trap, resulting in his demise. Locus examination by the forensic medical examiner ruled out any question as to the original position at death. Abrasions on the body parts in contact with the internal rims of the tires indicate friction while slipping down. The characteristic distribution of post-mortem hypostasis, the stiffening of the body in hyper flexion, localized abrasion due to chin pressing against the chest and urine collected over the rubber air tubes at the bottom were additional confirmatory evidence to that fact. Exclusion of other possible causes of death by complete autopsy was an important adjuvant to evidence based on scene investigation and external examination.

#### 4. Conclusions

In absence of proper scene of death investigation, the cause of death in positional asphyxia would be a matter of speculation. It may be taken into account, however, in cases where the position of the body was such that it hinders the process of respiration; and where there was a reason for the impossibility of changing that position; and where other possible significant underlying causes of death, natural or violent, had been excluded. In this case, restrictive position of the victim caused his body to be jack-knifed, with severe hyper flexion of head, neck and abdomen.

The role of intoxication by alcohol or other inebriants is important in inhibiting normal reflexes so that the deceased would neither be capable of correcting his abnormal position nor escaping the restrictive elements. It is also the reason behind misjudgment of the circumstances and recklessness leading to that unfortunate accident.

#### Ethical approval

Ethical issues are covered by a consent form signed by the next of kin of the deceased not objecting to use information and pictures in scientific papers.

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None declared.

#### Conflict of interests

There are no conflicts of interests in this case report article.

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